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Information transfer for wildlife management

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Abstract Wildlife Services (WS) is comprised of research [National Wildlife Research Center (NWRC)] and operations entities. WS personnel indicated that WS would operate more efficiently if information transfer between research and operations could be improved. In response, we conducted a survey of information transfer between WS research and operations. We surveyed wildlife management field employees in the operational component of WS to 1) determine whether they have sufficient access to wildlife management information, 2) identify some of their wildlife information needs, and 3) identify approaches to increase the efficiency of information transfer between research and operations personnel. Respondents indicated that operations personnel felt they received more wildlife management-related information from NWRC than from other sources. Respondents were evenly split as to whether they received adequate job-related information from NWRC. Perceived knowledge and applicability of 10 wildlife management techniques were correlated positively. Field personnel greatly valued interpersonal forms of communication. The most favored sources of information about wildlife management techniques were one-on-one training, workshops, demonstrations, and videos. Our findings suggest methods to improve information transfer not only within WS but also between research and field personnel throughout the wildlife management community.

Key words information transfer, wildlife management, wildlife services

The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) program (formerly Animal Damage Control) is the federal entity that provides leadership to manage problems that occur when human activity and wildlife conflict (United States Department of Agriculture 1994*a*). Specifically, WS is dedicated to minimizing wildlife damage to natural resources in agricultural, urban, and natural environments and reducing wildlife-related threats to public health and safety (Fagerstone and Clay 1997). WS consists of operations and research components. Operations consists of approximately 800 personnel distributed throughout the United

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States. They provide a diversity of hands-on and advisory wildlife management services to numerous parties, including private citizens, government agencies, and private businesses. The National Wildlife Research Center (NWRC) is the research component of WS. The NWRC consists of approximately 150 scientists and support personnel located in Fort Collins, Colorado, and 9 field stations throughout the United States. NWRC research activities focus on developing tools, techniques, and information to mitigate conflict between wildlife and human activities. Though these tools and information are made available to the wildlife management community, the primary end user is WS operations. The wildlife management community, including WS operations, also relies on universities for research and development of new techniques. To benefit field-level wildlife professionals, information must be transferred from universities to these wildlife professionals. WS employs a significant portion of the wildlife management professionals in the United States. In many ways, the organizational structure of WS parallels that of the wildlife management community, which consists of research (universities) and operations (pest-control operators, farmers, ranchers). Elucidation of means to increase information transfer from WS research to operations should be applicable to the entire wildlife management community.

WS personnel have indicated previously that WS would operate more efficiently if information transfer between research and operations could be improved. In response, we wanted to 1) objectively determine how well WS was doing at transferring information between research and operations, 2) determine the most efficient means to transfer job-related information, and 3) prioritize wildlife management techniques for information transfer efforts. After much deliberation, we determined an objective assessment of these factors to be impractical, if not impossible. Because surveys had been successfully used in the past to infer quality of service of the WS program (United States Department of Agriculture 1994*b*, United States Department of Agriculture 1996), we opted to acquire subjective survey data to achieve our goals. We distributed such a survey to WS operations wildlife management field personnel, the goals of which were to 1) quantify WS operations personnel's perception of adequacy of information transfer regarding wildlife management news, tools, and techniques developed by NWRC and outside sources (e.g., universities); 2) determine knowledge and applicability of various wildlife management techniques; and 3) determine value of various information sources to facilitate learning by wildlife professionals.

Methods

Questionnaire administration

Following standard guidelines, we developed a survey with input from the NWRC Director's office, WS Operations Regional Directors' offices, and APHIS Policy and Program Development staff (Dillman 1978, Sanborn and Schmidt 1995, United States Department of Labor 1995, Messmer et al. 1997). Addresses of all federally employed WS personnel in the job categories of district supervisor, wildlife biologist, wildlife specialist, and biological technician were compiled and mailing labels prepared by WS operational support staff. An initial mailing to 580 employees was completed in October 1996. At this time, copies of surveys and letters urging support were sent to the WS Deputy Administrator and the WS Eastern and Western Region Directors. State directors were contacted by telephone to solicit their support for this activity. In December 1996, 39 surveys were mailed to state directors and a second mailing was made to employees who had not responded to the October mailing.

Questionnaire development

Questions 1 and 2 addressed employee perceptions of the effectiveness of information transfer. Operations personnel responded to the statements, "I feel that I am provided with sufficient information regarding the latest wildlife damage management news, tools, and techniques developed by NWRC" (question 1) and "developed outside NWRC" (question 2). Responses were scored on a scale of 1 (strongly disagree) to 5 (strongly agree). Question 3 asked survey recipients to rate their knowledge level and applicability of wildlife management techniques that were substantially developed and made available for operational use by NWRC. These techniques were soft-catch traps, methyl anthranilate fogger, alpha-chloralose, tranquilizer trap device, DRC-1339 (3-chloro-*p*-toluidine hydrochloride), beaver-pond levelers, electronic guards, guard animals, electric fencing, and breakaway snares. For knowledge, techniques were to be rated on a scale of 1 (no knowledge) to 5 (great knowledge). Applicability scale ranged from 1 (no

applicability) to 5 (great applicability). Questions 4 and 5 asked survey recipients to rate on a scale of 1 (least valuable) to 5 (most valuable) the current, past (question 4), and potential or future (question 5) value of fact sheets, research articles and technical reports, videos, audio-cassettes, one-on-one (on-the-job) training, workshops and demonstrations at meetings, and internet online websites as formats to learn about wildlife management techniques. Respondents also were encouraged to provide suggestions to increase information transfer between WS research and operations. Suggestions were to be written in space provided on the survey or attached on a separate sheet. To permit further analysis, respondents' job title, length of service with WS, and location of employment were requested.

Analysis

We calculated summary statistics for responses using Statistical Package for the Social Sciences® (SPSS 1993), Version 6.0. Significant differences between mean responses for questions 1 and 2 and for responses by eastern versus western region were determined by 2 sample *t*-tests. One-way analysis of variance (ANOVA) was used to compare responses by years of service (0 to 2 years, 2 to 10 years, and greater than 10 years) and job classification (specialist, technician, wildlife biologist, district supervisor, state director). Significant differences in regional responses to knowledge and applicability and learning value questions were tested by comparing two binomial proportions (Ott 1993).

We tested the correlation between perceived applicability and knowledge for individual wildlife management techniques by Pearson's chi-square tests (SPSS 1993). We compared knowledge and applicability responses for wildlife damage management techniques and current and future learning value responses for information sources by individual randomized complete block ANOVAs with factors subject (block) and knowledge or subject (block) and applicability (SAS/STAT 1989). Multiple comparisons were made using Tukey's Least Significant Difference (Winer 1962).

Results and discussion

Of the 613 surveys mailed to the entire population of federal WS operations wildlife management field personnel, 485 surveys were completed and returned. Thirteen surveys were returned as undeliverable. Given the great overall response rate of 81%, we did not conduct a nonresponse analysis. Additionally, many respondents added handwritten comments, increasing the potential value of these surveys.

Information transfer

The mean responses (Table 1) of 3.00 and 2.72 for questions 1 and 2, respectively, differed significantly ($P<0.001$). This suggests that WS field personnel felt they received more wildlife management information from NWRC than from outside sources. This conclusion is reinforced by examining the difference columns, which indicated that 10.7% more respondents were dissatisfied with the adequacy of the information received from outside sources than from NWRC. Additionally, 11.5% more respondents felt they received adequate information from NWRC than from outside sources. However, because 31% of respondents disagreed that the information they received about research techniques was adequate, these data suggest that WS could significantly improve information transfer between research centers and its operations component. Perceptions of information transfer did not differ significantly by geographic region, job category, or years of service ($P<0.001$).

Table 1. Survey respondents level of agreement with the statement, "I feel that I am provided with adequate information regarding the latest wildlife damage management tools, and techniques developed by NWRC or outside NWRC".

		By NWRC		Outside NWRC		Difference	
Response	Value	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Strongly disagree	1	46	9.5	62	12.8	-16	-3.3
Disagree	2	106	21.9	142	29.3	-36	-7.4
Neutral	3	151	31.1	155	32.0	-4	-0.9
Agree	4	123	25.4	74	15.3	49	10.1
Strongly Agree	5	38	7.8	31	6.4	7	1.4
No response	0	21	4.3	21	4.3	0	0

Table 2. Knowledge and applicability ratings of wildlife management techniques used by WS personnel.

Technique	Rating[a]	
	Knowledge[b]	Applicability[b]
Methyl Anthranilate Fogger	1.52G	2.32F
Tranquilizer Trap Device	1.90F	2.41F
Alpha-Chloralose	2.53E	2.70E
Beaver Pond Leveler	2.60E	2.76DE
DRC-1339 Avicide	2.96D	3.16A
Electronic Guard	3.02D	2.65E
Break Away Snare	3.21C	3.13AB
Guard Animals	3.35C	2.76DE
Electric Fence	3.52B	2.96BC
Soft Catch Trap	3.70A	2.90CD

[a] Mean value of respondents' ratings on a scale of 1 (no knowledge, no applicability) to 5 (great knowledge, great applicability).

[b] Means with different letters within a column differ significantly at $P \leq 0.05$.

Knowledge and applicability (question 3)

Though there are significant differences between employees' knowledge and perceived applicability for the techniques surveyed, in general there is a positive correlation between applicability and knowledge (Table 2). Pearson's chi-square analysis of responses indicated that knowledge and applicability were related significantly ($P<0.001$). This correlation likely results from 2 situations: 1) increasing field personnel's knowledge of a particular technique will likely result in increased use of that technique and 2) field personnel feel they are more knowledgeable of techniques they already use. Analyses of variance results demonstrated that both applicability ($P<0.001$) and knowledge ($P<0.001$) were significant. Knowledge and applicability responses for the newest experimental techniques, such as methyl anthranilate foggers and tranquilizer trap devices, received the lowest ratings. Respondents felt they were most knowledgeable about soft-catch traps and electric fences and that DRC-1339, electric fences, breakaway snares, and soft-catch traps were the techniques most applicable to their management activities.

To determine information needs relative to the perceived knowledge and applicability of management techniques, we developed frequency matrices that summarized the knowledge and applicability responses for each technique (soft-catch traps, guard animals, etc.). Examination of the distribution of responses enabled us to prioritize our information transfer efforts. For example, more than 54.8% of respondents indicated that they have no knowledge of tranquilizer trap devices and 68.5% indicated that they have less than a moderate knowledge (none – slight) of this technique (Table 3). Furthermore, summing the moderate, substantial, and high applicability and none and slight knowledge indicate that 50 of the 263 (19%) respondents perceive tranquilizer trap devices as being at least moderately applicable to their job, even though they possess little knowledge of this technique. This indicates that tranquilizer trap devices are a great priority for information transfer. It's also likely that as more field personnel become knowledgeable about tranquilizer trap devices, the perceived applicability for this technique will increase.

We also prepared separate wildlife damage management technique frequency matrices for responses from western and eastern regions. Analysis of these matrices indicated that the need for specific information on techniques varies with region. In the East, there is a greater perceived need for information on the avian wildlife management techniques DRC-1339 and alpha-chloralose. Mammalian predator induced losses are a greater concern to wildlife management professionals in the West; bird induced losses are a greater concern in the East. These conclusions are consistent with the regional nature of wildlife damage in the United States.

Table 3. Frequency matrix of responses for tranquilizer trap device applicability and knowledge.

Applicability	Knowledge						
	None	Slight	Moderate	Substantial	High	Total	Percentage
None	99	10	12	4	1	126	47.9%
Slight	10	11	11	6	0	38	14.4%
Moderate	13	5	21	8	0	47	17.9%
Substantial	11	6	4	4	0	25	9.5%
High	11	4	4	3	6	27	10.3%
Total	144	36	52	25	6	263	100%
Percentage	54.8%	13.7%	19.8%	9.5%	2.3%	100%	

Table 4. Current and future learning value of information sources.

Information source	Rating[a]	
	Current learning value[b]	Future learning value[b]
Internet	2.40A	3.02A
Audio Cassettes	2.72B	3.06A
Videos	3.53C	4.21C
Fact Sheets	3.49C	3.79B
Research Articles	3.66C	3.96B
Workshops	4.26D	4.63D
One-on-One	4.72E	4.87E

[a] Mean value of respondents' ratings ona scale of 1 (least valuable) to 5 (most valuable).

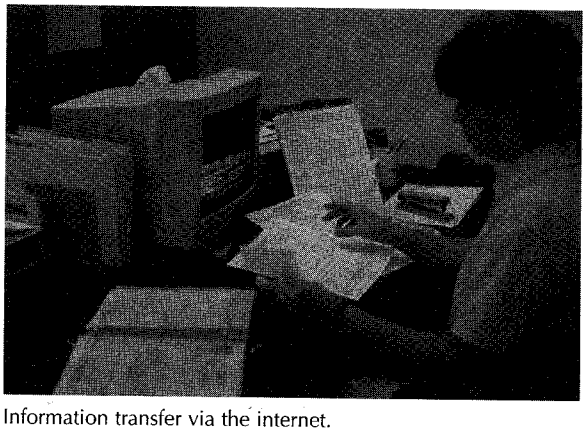
[b] Means with different letters within a column differ significantly at $P \leq 0.05$.

Information sources

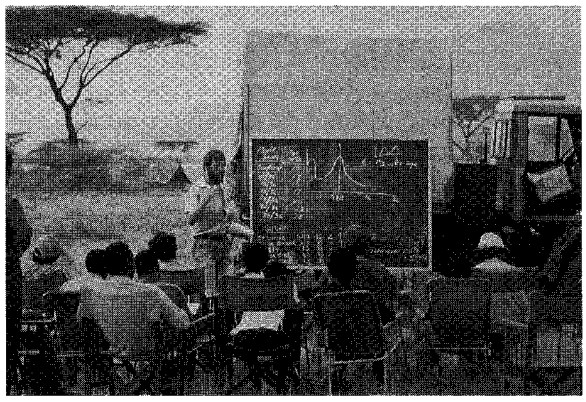
Respondents differed regarding the learning value of various sources ($P<0.001$). Regarding current learning value, one-on-one interactions were deemed the most valuable, followed by workshops (Table 4). Videos, fact sheets, and research articles were rated equally and were of medium current learning value. Of least importance were the Internet and audiocassettes. A slightly different trend was noted for future learning value. Again, one-on-one interactions were rated as the most valuable, followed by workshops. These were followed by videos, which were rated more highly than the equally rated fact sheets and research articles. Of least importance for future learning value were the equally rated Internet and audiocassettes.

Though field wildlife management personnel learn most effectively via interpersonal communication, scientists are typically trained to communicate via written sources, such as peer-reviewed journal articles. Bridging this gap is essential to increase information flow from research to operations. Despite the proliferation of sources of information, our findings suggest that interpersonal communication is the most effective means of information transfer and education for wildlife damage management information. The success and applicability of this approach is born out by a review of the Cooperative Extension Service in the United States. Because of the Morill Acts in the 1850s and the Hatch Act of 1887, a series of land-grant colleges specializing in agricultural research and teaching proliferated across the United States. However, a significant problem remained; the existing system disseminated information very slowly (Scheuring 1988). Many farmers distrusted "book learning" and could not be convinced to adopt or even evaluate new methods. In 1898, the United States Department of Agriculture hired S.A. Knapp, an agricultural teacher, to promote agricultural advances throughout the southern United States. His hands-on approach to education, "What a man hears, he may doubt; what he sees, he may possibly doubt; what he does, he cannot doubt," was immensely successful and created the model for Cooperative Extension Service, which was initiated in 1914 (Shaffner 1991). Our findings indicate that this approach remains valid to disseminate wildlife damage management information to field personnel.

Our evaluation of the handwritten comments suggested that some personnel are frustrated with the paucity of information they receive from NWRC and other research centers. It was apparent that many respondents were not aware of the contribution that NWRC scientists have made to the wildlife management techniques they routinely use. Respondents suggested that this may be a result of the inefficiency of filtering information through the various layers of the organization to the "grass roots" level of wildlife specialists and biologists. They suggested that this could be alleviated by distributing information directly to them rather than to the regional and state offices for subsequent distribution. Obviously, increasing the flow of information from research to all levels of the wildlife management community will increase knowledge of and subsequently satisfaction with wildlife management research centers.



Information transfer via the internet.



Wildlife damage management workshop.

Also, involving field personnel in testing new techniques should increase field level "buy-in" and ultimate acceptance of new techniques. This arrangement also encourages feedback from the ultimate users, leading to an improved final product. Finally, leadership by management and extension personnel to encourage wildlife management professionals to be receptive to new ideas and approaches also may increase the efficiency of information transfer.

Evaluating the recommendations

To evaluate the validity of our conclusions, we compared the information transfer recommendations inferred from the survey results with procedures used previously for information transfer of soft-catch traps, the technique about which WS operations field personnel felt they were most knowledgeable. Development of an effective soft-catch trap began more than 20 years ago at NWRC. The Research Center collaborated with manufacturers to develop a soft-catch trap that performed like a traditional foothold trap. Studies were conducted in collaboration with operations employees to evaluate soft-catch traps under field conditions. Results were presented in scientific literature, as well as at many state and regional operations meetings and workshops. Finally, acceptance of soft-catch traps was encouraged by WS managers. This comparison indicates that the information transfer recommendations suggested by the survey results are valid and that the application of this model to other wildlife management techniques would likely result in improved information transfer between research and field level operations professionals.

Implications for information transfer to wildlife management field personnel

As wildlife management professionals face ever-changing challenges, continuous education is imperative. The analysis of our survey responses suggested that efficient information transfer can be accomplished by 1) focusing resources on one-on-one interactions, workshops and demonstrations, and videos; 2) sending information directly to field personnel rather than through additional layers of the organization; 3) increasing the field personnel's awareness of the contributions of research to tools and techniques they are currently using; 4) involving field-level professionals to evaluate new techniques; and 5) encouraging leadership at all organizational levels to accept and implement new wildlife management tools and techniques. These approaches also may be applicable to other organizations and professions with similar structures. We encourage them to seriously evaluate information transfer within their organizations as we have done here.

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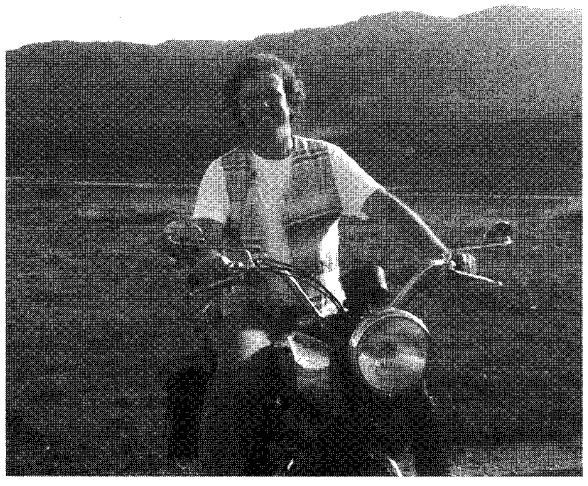

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